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## CLAIMS:

(109)

1. A valved cross over nozzle for injection molding apparatus said cross over nozzle comprising:

a nozzle housing with a melt passage extending therethrough, a valve axis extending along said passage and a tapered valve seat in said passage extending about said valve axis;

said nozzle housing having a first housing part and a second housing part separable along said valve axis through said valve seat at a housing interface, with a first valve seat part being carried by said first housing part and a second valve seat part being carried by said second housing part;

a valve member having a tapered valve head disposed in said passage and axially movable relative to said nozzle housing between a closed configuration wherein said valve head engages said valve seat to block melt flow along said passage and an open configuration wherein said valve head is displaced from said valve seat to allow melt flow along said passage about said valve head;

said valve head having a first valve head part and a second valve head part which meet at a valve interface corresponding to said nozzle interface and at which said valve member is separable along said axis into first and second valve head parts for respectively sealing said first and second nozzle parts in said closed configuration, said first and second valve head parts are suitable for first being joined and then being moved together as one member in the same direction relative to the housing;

a valve opening actuator acting between said valve member and said nozzle housing for causing simultaneous movement of said first and second valve head parts relative to said nozzle housing toward said open configuration when said first and second nozzle housing parts and first and second valve head parts are joined;

a first valve closing actuator acting between said first valve head part and said first housing part to bias said first valve part toward its closed configuration; and,

a second valve closing actuator acting between said second valve head part and said second housing part to bias at least said second valve part toward its closed configuration.

2. The cross over nozzle of claim 1 wherein:

said valve opening actuator is a fluid pressure responsive first piston in a bore associated with said first housing part;

a first valve stem extends between and operably connects said piston and said first valve head part;

said first piston further acts as said first valve closing actuator;

a fluid pressure responsive second piston in a bore associated with said second housing part acts as said second valve closing actuator; and,

a second valve stem extends between and operably connects said second piston and said second valve head part.

3. The cross over nozzle of claim 1 wherein:

said first housing part has a base part and an outer part which are telescopically connected for relative axial movement along said valve axis;

a biasing means acts between said base part and said outer part to urge said outer part away from said base part;

said first valve seat part is carried by said outer part;

a first valve stem extends between and rigidly secures said first valve head part and said base part;

said first valve head part engages said first valve seat part to limit movement of said outer part away from said inner part;

said valve opening actuator causes movement of said second housing part toward said first housing part and acts against said biasing means to urge said outer part of said first housing part toward said base part in turn causing relative movement of said valve head and said valve seat to move said valve member into said open configuration;

said biasing means between said base part and said outer part of said first housing part acts as said first valve closing actuator;

a second valve stem extends between and operably connects said second valve head part with said second closing actuator.

4. The cross over nozzle of claim 3 wherein:

said biasing means is at least one of a resilient biasing means and fluid pressure; and,

said second valve closing actuator is at least one of a resilient biasing means and a fluid pressure responsive piston in a bore associated with said second housing part.

5. The cross over nozzle housing of claim 1, 2, 3 or 4 wherein:

said first valve head part and said second valve head part are provided with cooperating locating means to align said first and second valve head parts when said first and second valve head parts are joined.

6. The cross over nozzle housing of claim 5 wherein:

said locating means include at least a projection and a corresponding recess for receiving the projection,

7. The cross over nozzle housing of claim 5 wherein:

said second housing part includes an inner part and a cover which are telescopically connected for relative movement therebetween parallel to said valve axis by an amount not exceeding a stroke of said second closing actuator;

said second valve seat part is carried by said cover;

a cushioning means acts between inner part and said cover to urge said inner part and said cover apart and yields upon joining of said first and second housing parts to cushion an initial joining impact therebetween.

8. The cross over nozzle of claim 3 wherein:

at least a portion of said first valve stem sealingly engages said first housing part; and,  
said melt passage extends along an interior of said first valve stem.

9. The cross over nozzle of claim 8 wherein:

at least a portion of said second valve stem sealingly engages said second housing part; and

said melt passage extends along an interior of said second valve stem whereby in said open configuration said melt flows along said interior of said first and said second valve stems and about said valve member between said valve member and said seat.

10. The cross over nozzle of claim 9 wherein:

said melt passage extends axially along said interior of said first and second valve stems; and,

— said melt passage diverges toward said first valve head part and said second valve head part to exit said valve stem through at least one opening adjacent each of said first and said second valve head parts.

11. The cross over nozzle of claim 10 wherein:

said biasing means acts against a face of said mould;

said outer part, said first valve head part and said first valve stem are removable from said mould face without mould disassembly;

said second housing part has an inner section and an outer section with said second valve seat part being carried by said outer section; and,

said outer section and said inner section are separably axially joined to provide for removal of said outer section, said second valve head part and said second valve stem without mould disassembly.